ARIZONA PASSENGER RAIL CORRIDOR STUDY

Tucson to Phoenix

Draft Tier 1 Environmental Impact Statement

Executive Summary

September 2015

Submitted to:

U.S. Department of Transportation
Federal Railroad Administration

Submitted by:

Arizona Department of Transportation
Multimodal Planning Division

ARIZONA PASSENGER RAIL CORRIDOR STUDY: TUCSON TO PHOENIX

Tier 1 Draft Environmental Impact Statement

Submitted pursuant to 23 CFR 771, 16 U.S.C. 470(f), 33 U.S.C. 1251, 42 U.S.C. 4332(2)(c), 49 U.S.C. 303, and 49 U.S.C. 1601 *et seq.*

FRA will issue a single document that consists of the Final Environmental Impact Statement and Record of Decision pursuant to Pub. L. 112-141, 126 Stat. 405, Section 1319(b) unless FRA determines that statutory criteria or practicability considerations preclude issuance of such a combined document.

prepared by

Federal Railroad Administration

and

Arizona Department of Transportation

in cooperation with

Federal Transit Administration
Federal Highway Administration

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Review and Comment

After reading the Draft Tier 1 EIS, please provide specific written comments. Comments on the contents of the EIS may be e-mailed to projects@azdot.gov, given in person at the hearings (see below), in writing through the project website, www.azdot.gov/passengerrail/, or by fax or mail. All comments are due by October 30, 2015. Comments should be sent to:

ADOT Passenger Rail Study Team
24 W. Camelback Road, Suite 479
Phoenix, AZ 85013
FAX: 602.368.9645

Public Hearings

Public hearings on the Draft Tier 1 EIS will be held on September 15, 16, and 17, 2015 from 5:30 p.m. to 7:00 p.m., with video presentations beginning at 5:45 p.m. and 6:20 p.m. The same information will be presented at each location:

Tuesday, September 15
Burton Barr Branch Phoenix Public Library
First Floor Pulliam Auditorium
1221 North Central Avenue
Phoenix, AZ 85004

Wednesday, September 16
Tucson Convention Center
Leo Rich Theater
260 South Church Avenue
Tucson, AZ 85701

Thursday, September 17
Central Arizona College
Signal Peak Campus, Room M101
8470 North Overfield Road
Coolidge, AZ 85128

Document Availability

In addition to viewing online on the project website, www.azdot.gov/passengerrail/, the Draft Tier 1 EIS can also be reviewed at the following locations:

Burton Barr Branch
Phoenix Public Library
1221 North Central Ave.
Phoenix, AZ 85004

Downtown Branch
Chandler Public Library
22 South Delaware Street
Chandler, AZ 85225

ADOT Research Library
206 South 17th Ave.
Phoenix, AZ 85007

Pima Community College
Northwest Campus
Library
7600 North Shannon Road
Tucson, AZ 85709

Central Arizona College
Signal Peak Campus
Library
8470 North Overfield Road
Coolidge, AZ 85128

Southeast Regional
Library – Gilbert
775 North Greenfield Road
Gilbert, AZ 85234

Executive Summary

The Arizona Department of Transportation (ADOT) has identified a need for an alternative transportation mode to help meet existing and future travel demand in the Pima, Pinal, and Maricopa tri-county area. By 2035, the travel time between Tucson and Phoenix via Interstate 10 (I-10) is projected to take 26 percent longer than the travel time in 2010 and, by 2050, 59 percent longer, even if the highway is widened to 10 lanes. The Arizona Passenger Rail Corridor Study (APRCS), led by the Federal Railroad Administration (FRA), builds on statewide and regional planning efforts and initiatives to investigate alternative approaches to implementing passenger rail service between Tucson and Phoenix, Arizona's two largest cities.

ADOT's study team developed a range of corridor alternatives with the goals of serving key population and activity centers, maximizing potential ridership, minimizing environmental impacts, and being cost effective. An iterative planning and outreach process identified potential routes; these were documented in an Alternatives Analysis (AA) report. Each has undergone multidisciplinary consideration, leading to a set of corridor alternatives. Two corridor alternatives, in addition to a No Build Alternative, are examined in this Draft Tier 1 Environmental Impact Statement (EIS), through a process prescribed by the Council on Environmental Quality in compliance with the National Environmental Policy Act (NEPA).

This summary provides a synopsis of the eight chapters comprising the Draft Tier 1 EIS for the APRCS. An EIS analyzes the natural, built, and social environment that may be affected by alternative actions being considered and identifies the potential environmental effects of each so they can be compared to one another and to the effects of taking no action (the No Build Alternative). The information, analysis, and comparison of effects, as well as input received from the public, are intended to aid government agencies in making decisions about public expenditures and infrastructure investment.

Following the sequence of the chapters in the EIS, the Executive Summary outlines the transportation problem identified in the **Purpose and Need** (Chapter 1) and explains how a wide range of **Alternatives Considered** (Chapter 2) were narrowed through a series of screenings. This summary gives an overview of the extensive **Public and Agency Coordination** (Chapter 3) taking place to gather feedback and input from the public, regulatory agencies, and local jurisdictions over the course of the study and outlines the **Transportation Impacts** (Chapter 4) associated with a passenger rail system within the corridor alternatives analyzed in the EIS. Coming to the core of the resource analysis, the Executive Summary gives a synopsis of the **Existing Conditions and Environmental Consequences** (Chapter 5) of a Tucson-to-Phoenix passenger rail system within the two corridor alternatives, presents the results of a preliminary **Cost Analysis** (Chapter 6), provides an overall **Comparison of Alternatives** (Chapter 7) in which

ADOT identifies a locally preferred alternative, and briefly diagrams the **Next Steps** (Chapter 8) of the APRCS.

The Tier 1 EIS examines the general effects on the environment that could reasonably be anticipated from construction and operation of a future passenger rail system within two 1--mile-wide corridor alternatives, as well as the effects of the No Build Alternative. A tiered analysis generally uses existing, readily available data to establish baseline conditions, often reporting ranges of impacts that could prevail, without reference to a specific alignment or project. In the interest of full disclosure, worst-case assessments are sometimes reported to indicate potential impacts in a defensible manner.

Until a project-level analysis is undertaken, specific impacts, benefits, and mitigation measures cannot be precisely identified or examined in detail. Should the federal lead agencies select a corridor alternative, a detailed analysis would take place and be reported in subsequent Tier 2 NEPA documents.

Purpose and Need

State and regional planning initiatives have recommended implementing passenger rail to add travel capacity to what is already offered by highways. Having an additional travel mode for the trip between Tucson and Phoenix could enhance highway safety and reduce air pollutant emissions. ADOT's 2010 Statewide Rail Framework Study and subsequent State Rail Plan showed that of all possible locations within the state, a passenger line between these two cities would serve the most people. Such a line could connect intermediate locations within the region and be the starting point for later rail connections to other regions of the Southwest and beyond.

Need for Passenger Rail Service

In recent decades, population and employment within the Pima, Pinal, and Maricopa three-county Study Area have increased. With only 17 percent of Arizona's land in private ownership, most of the state's developable land is located between the Tucson and Phoenix metropolitan areas and is projected to develop as a continuous urban corridor between these two cities.

Based on population and travel forecasts, travel markets in the region are expected to continue growing in the future. These changes will contribute to the need for increased commuter and intercity mobility within the corridor; however, opportunities to increase the carrying capacity of the region's roadway network are limited. As western Pinal County continues to be developed, traffic congestion on area highways will cause an unacceptable increase in travel times, reducing mobility and productivity in the region.

Travel between Tucson and Phoenix along I-10 is affected by increasing congestion; and, based on forecasts, even a planned widening of this freeway and the construction of a planned North-South Corridor will not provide adequate capacity to meet the expected travel demand. Rather than increase capacity by adding lanes to I-10 (which cannot be done in some sections), an alternative transportation mode could help meet existing and future travel demand by providing additional capacity that would not be affected by unpredictable highway conditions.

Need for Commuter Travel

Commuter services, where most travelers make a same-day round trip during peak commuting periods, are also in demand within the Tucson and Phoenix metro areas. Ridership on other fixed-route transit systems serving these cities has exceeded projected figures. Demand for this type of service will grow in the future, as population growth in this corridor is projected to continue over the next few decades.

As residential development has spread from the major cities to outlying areas, the average journey to work within the study area has likewise grown longer. Data from the Census Transportation Planning Package (CTPP) from 2006-2010 indicate that daily inter-county commute trips within the three-county Study Area exceeded 80,000.

Need for Intercity Travel

As population and travel demand grow, the region's transportation network will suffer from increasing congestion and time delays—especially in metropolitan areas, at and around airports, and on weekends and holidays. This decline in the quality of the travel experience adversely affects intercity travelers, other users of the system, commercial carriers, and the general public.

Need for Improved Connectivity within the Region and Beyond

Several modes of passenger service—both intercity and commuter—are currently available in the Tucson to Phoenix corridor. While each partially addresses some aspect of the region's travel needs, most operate independently of one another. They may be viewed as emerging elements of a regional transit network but are missing a unified plan and a strong backbone tying the network together. Notably, Phoenix is the only metropolitan area in the United States with a population over 1 million without a commuter or regional passenger rail system. A reliable Tucson-to-Phoenix rail connection could provide the missing backbone, close the gap that currently exists for potential commuters and intercity travelers, and achieve synergies by creating and delivering a robust customer base for a future network of commuter and intercity services.

Purpose of the Arizona Passenger Rail Corridor Study

The overall Tucson-to-Phoenix corridor is being studied to address intercity travel needs where the demand for such travel is growing while opportunities for highway expansion are limited. An intercity connection between these two cities could provide the infrastructure for commuter service overlays in the urban areas, designed with the ability to grow along with commuter travel demand and reach into and across Pinal County from both ends. Commuter services could span the entire corridor as Pinal County's employment base grows and establishes new patterns of daily trip interchanges within the corridor.

The purpose of proposed passenger rail in Arizona is to provide high capacity intercity and commuter transit service in the identified study area to address the identified transportation problems, within the larger framework of promoting regional connectivity throughout Arizona and the western United States (US). The purpose of proposed passenger rail service in Arizona includes:

a) providing transportation alternatives to the automobile and reduce the congestion growth rate

b) Increasing access to existing and planned employment and activity centers

c) Supporting reliable travel times and safe travel in an increasingly congested region that currently affords few transportation alternatives to the automobile

d) Connecting the suburban and rural areas between Tucson and Phoenix

e) Facilitating continued development of a comprehensive, multimodal, and interconnected regional and multi-regional transportation network that provides mobility choices for existing and future needs and allows connectivity to systems beyond the Tucson-Phoenix corridor

Alternatives

An AA report was developed as part of the APRCS to document the assessment of transportation opportunities that led to the selection of the corridor alternatives evaluated in the Draft Tier 1 EIS. While the alternatives developed for this analysis were based largely on new original work, information from past studies and empirically collected information guided alternatives criteria and comparison of study results.

The AA identified all reasonable connections between Tucson and Phoenix and initially considered all available transportation modes. In keeping with the Purpose and Need, automobile travel was eliminated from further consideration because it is not projected to fully satisfy anticipated demand. Expanding existing bus services was deemed to have the same

limitations as autos and was also eliminated from further consideration. Air travel was not competitive in terms of time or cost and could not effectively serve destinations between the Tucson and Phoenix hubs. This left passenger rail and dedicated bus rapid transit (BRT) as the primary modal choices to be refined through further analysis.

Potential alignment segments and locations served were screened based on broad assessments of land use compatibility, effect on the environment, travel markets, and estimated cost. The Level 1 screening criteria established a tiered ranking of these performance measurements and included input from the public, agencies, and professionals with pertinent expertise.

Alternatives deemed most viable by the initial analysis served population centers between the Tucson and Phoenix hub locations with a relatively direct route (i.e., minimal or no reverse direction travel). The initial screening analysis showed that from over 150 possible route alternatives, seven conceptual alternatives provided the most effective movement in terms of service, travel time, generalized cost (based on distance), accessibility, and potential environmental effects. All seven conceptual alternatives follow existing transportation corridors to allow opportunities for construction on previously developed land, although one alternative was planned to collocate right-of-way (ROW) with the proposed North-South Corridor through a largely undeveloped and otherwise agricultural area. The seven conceptual alternatives are briefly described below:

- **Blue –** BRT alternative along I-10 in dedicated lanes
- **Green –** A rail alternative connecting Tucson and Phoenix along I-10 and the Union Pacific Railroad (UP) Tempe Branch
- **Orange –** A rail alternative along I-10, the planned North-South Corridor, a designated transit corridor in the proposed Superstition Vistas master-planned community, and the US 60 Superstition Freeway
- **Teal –** A rail alternative along I-10, the planned North-South Corridor, the UP Phoenix Subdivision's Southeast Branch, and Rittenhouse Road
- **Yellow –** A rail alternative entirely along UP ROW or track, including the Phoenix Subdivision's Southeast Branch
- **Purple –** A rail alternative along I-10 from Tucson, turning north through the Gila River Indian Community north of Casa Grande to join the UP Chandler Branch into Phoenix
- **Red –** A rail alternative along I-10 from Tucson continuing along the Maricopa-Casa Grande Highway into the City of Maricopa, then following State Route (SR) 347 to the UP Tempe Branch into Phoenix

A subsequent round of analysis in the AA determined that three of the seven conceptual alternatives had fatal flaws or other characteristics that rendered them noncompetitive, and they were eliminated from further study. The rationale for eliminating the Blue, Purple, and Red alternatives follows:

- **Blue** –The Blue (BRT) Alternative would not meet the Purpose and Need, as the alternative would be subject to the same highway conditions on I-10 as automobile traffic. In addition, the Blue Alternative was least popular among the public based on submitted comments and survey results. High-level operating cost estimates also indicated that operation and maintenance costs for bus service would be much greater in the long term than for a rail alternative while having substantially lower passenger capacity.
- **Purple** – This rail alternative passes through the Gila River Indian Community's (GRIC) population center in Sacaton to join the UP Chandler Branch. The portion of the alternative through GRIC presents potential impacts on Tribal land and cultural and historic resources.
- **Red** – This alternative travels over a longer distance than other alternatives, serves fewer population centers, and has potential impacts on GRIC similar to the Purple Alternative.

The Green, Orange, Teal, and Yellow corridor alternatives initially emerged from the Level 2 screening as the final alternatives; however, a third round of screening resulted in only the Yellow and Orange alternatives ultimately being advanced for analysis in the Draft Tier 1 EIS as corridor alternatives. The Green and Teal alternatives were eliminated from consideration for the following reasons:

- **Green** – While shortest in distance and projected travel time, this rail alternative has less potential ridership and serves fewer population centers compared with other alternatives. The Green Alternative assumes future widening of the existing I-10 easement through tribal land. The introduction of a new transportation mode is incompatible with existing agreements between ADOT and GRIC regarding the I-10 easement. Further development of the alternative and coordination during the course of the AA process raised uncertainties about the widening and its effect on tribal resources. The GRIC Tribal Council accepted the removal of the Green Alternative from consideration in the APRCS with the understanding that complementary transit connections to GRIC would be included if one of the corridor alternatives is selected.
- **Teal Alternative** – While the Teal Alternative could serve as an option should conflicts arise with a preferred corridor alternative, analysis of the Teal Alternative in the Tier 1 EIS was deemed unnecessary, as potential effects within the Teal corridor alternative would be covered in the evaluation of the Yellow and Orange corridor alternatives.

The AA focused on alternatives that closely follow existing or proposed infrastructure elements; however, the Tier 1 Draft EIS evaluated them at a corridor level, with the intent of providing a basis for identifying high-level impacts and understanding system performance. The Orange and Yellow alternatives are treated as 1-mile-wide corridor alternatives in the Draft Tier 1 EIS (see **Figure ES-1**), reserving environmental evaluation of specific alignments for future study phases.

The No Build Alternative assumes that existing and committed projects within the study corridor would occur, but no passenger rail system would be developed between Tucson and Phoenix. This alternative includes all transportation facilities and services programmed for implementation within the three-county Study Area, including transit, roadway, and highway improvements identified in the Transportation Improvement Programs (TIPs) of Maricopa Association of Governments (MAG), Central Arizona Governments (CAG), the Sun Corridor Metropolitan Planning Organization (SCMPO), and the Pima Association of Governments (PAG), as well as other significant improvements in various stages of planning, design, or construction.

Public and Agency Coordination

Agencies, nongovernmental groups, and the public were engaged throughout the planning process for the APRCS, as required by federal law.

Executive Order 12898 requires that, as part of the environmental evaluation of the alternatives, the project must address environmental justice issues to disclose effects on minority and low-income populations. To comply with this requirement, community demographics and socioeconomic impacts were considered in analyzing the alternatives, and the public participation process was designed to ensure “full and fair participation by potentially affected communities” throughout the duration of the study.

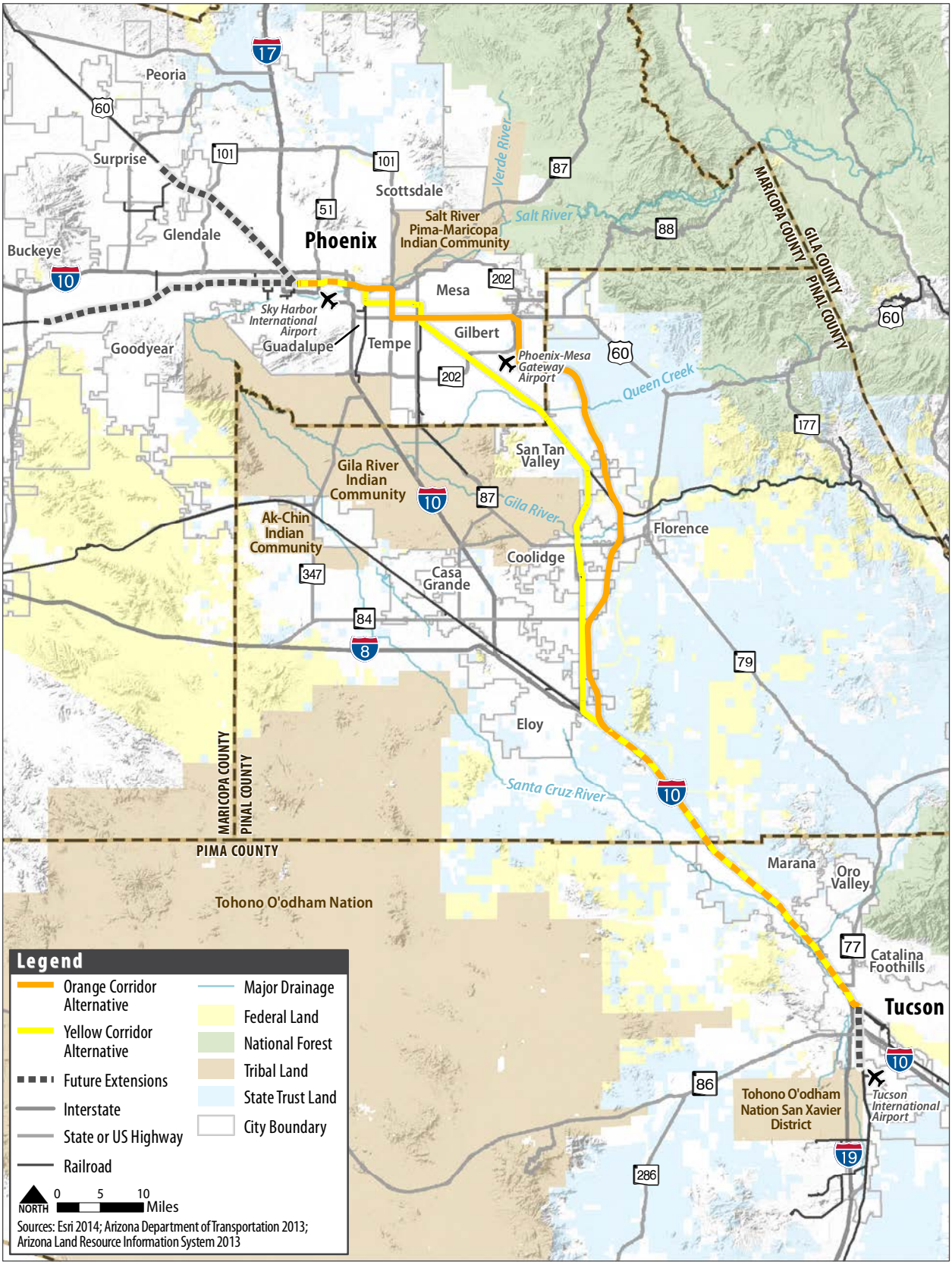
All meetings were held in accessible facilities in compliance with the Americans with Disabilities Act (ADA). Every effort has been made to respond to members of the public who require a sign language interpreter, an assistive learning system, a translator, or any other accommodations to facilitate participation in the planning process.

Public involvement efforts for the study began with project kickoff in March 2011. Opportunities for public comment and information sharing have been ongoing using ADOT’s project website and a network of agencies and public contacts established for this study.

Public Outreach Techniques

Because of the 120-mile length of the study corridor, major emphasis was placed on electronic communication and appearing at already scheduled events to maximize participation.

Figure ES-1. Corridor Alternatives Carried Forward for Detailed Study



Information disseminated through the ADOT website and at public events has included meeting announcements, brochures, media releases, fact sheets, and surveys that helped indicate public preferences throughout AA and Draft Tier 1 EIS development. Corridor-wide community status updates have been held with public and agency staffs as alternatives were refined and less effective options removed from further study. Having over 10,000 project preference surveys completed by members of the public has led to a better understanding of what individuals believe is important and which alternatives best meet those expectations.

Government and Other Stakeholder Coordination

Government agencies throughout the corridor have been actively engaged in the APRCS, including opportunities to be participating or cooperating agencies in the study process. Feedback was solicited through direct contact from elected officials; government agencies and stakeholders; interested organizations; and community groups.

Lead, Cooperating, and Participating Agencies

FRA is the lead agency for the study. ADOT is the local sponsoring agency and is the designated recipient of study funds.

The Federal Transit Administration (FTA) and the Federal Highway Administration (FHWA) are cooperating agencies on this study because of the project's potential effects on urban transit services, interstate and state highway ROWs, and planned transportation facilities. No other cooperating agencies were designated for the APRCS; however, other federal agencies have indicated an interest in becoming cooperating agencies during Tier 2 NEPA studies.

Sixty-two federal, state, regional, and local government agencies interested in the project were invited to serve as participating agencies. Agencies that accepted this role provided input to scoping, purpose and need development, and identification of potential effects.

Lead, cooperating, and participating agencies worked cooperatively throughout the study's environmental process, with the goal of ensuring that all agency concerns are satisfactorily addressed.

Corridor Support Team

Meetings with the Corridor Support Team (CST), composed of all agencies within the corridor, were held at key points to gain input from stakeholders and help guide the study.

Starting in June 2011, ADOT distributed 370 email invitations; and ADOT staff and team members used word-of-mouth techniques to increase interest in the workshops.

Public Scoping

The Notice of Intent for this study was published in the Federal Register on October 6, 2011. Extensive email list distribution, media releases, social media communication, and e-mail distribution, social media distribution, and media coverage were relied upon to make the scoping process known to interested stakeholders and the public.

Seven paid legal and display advertisements announced scoping open houses and events in local and regional newspapers between September and October 2011 to comply with NEPA requirements.

ADOT held 12 scoping events (four in each study county) between October 7 and November 1, 2011, with a comment period ending November 14, 2011. A total of 141 people registered attendance at the 12 scoping events, and hundreds more stopped by ADOT booths at community events and spoke with study team members.

Video and print media formed a primary element of public participation. A two-minute video, booklet, and 12-question survey were made available in DVD and hard copy, as well as online. Between October 7 and November 14, 2011, the study team received 2,784 survey responses along with 291 additional comments submitted that did not follow the survey format. In general, comments reflected a need for an additional transportation option between Tucson and Phoenix and a preference for rail. Respondents indicated that if they had a viable alternative to traveling by automobile via I-10, they would make the trip more frequently.

The primary themes identified from the responses, listed in **Table ES-1**, helped the project team analyze the data.

Table ES-1. Public Scoping Comment Themes

Comment Category	# Unique Comments	% of Total Unique Comments
Financial Feasibility	1,199	8%
Operational Characteristics	1,841	13%
Safety and Security	1,720	12%
Mobility	6,858	48%
Environment	1,858	13%
Economy	742	5%

Slightly over 6 percent of the comments received indicated opposition to the concept of passenger rail between Tucson and Phoenix. The majority of the opposed comments cited:

- Imposing higher taxes to fund the project
- Finding better use for taxpayer dollars
- Fixing problems on I-10 before building something that is not an absolute necessity

Agency Scoping

ADOT distributed 111 invitations to state and local agencies as well as to Tribes on October 4, 2011 for an agency scoping meeting on October 11, 2011. Attached to the meeting invitations was a meeting agenda, study segment map, description of the segment areas, schedule of study milestones, comment form, and a state map showing the three-county Study Area.

A total of 66 agency representatives attended the meeting in person, and 34 participated via webinar.

Additional Outreach

Public and stakeholder involvement efforts extended beyond the scoping phase and have continued throughout the study. Two phases of extensive stakeholder and public outreach were held during the preparation of the AA, leading to the identification of the alternatives to be analyzed in the Draft Tier 1 EIS. These outreach programs were held in fall of 2012 and spring of 2014 at public venues in conjunction with scheduled events in communities within the corridor. Input from these efforts helped to narrow the range of alternatives considered during the evaluation process from the approximately 150 possible original routes to seven, and eventually to the final two corridor alternatives evaluated in the Draft Tier 1 EIS.

Draft EIS Public Hearings

As part of the NEPA process, the Draft Tier 1 EIS is being circulated for a 45-day review and comment period. During this period, the document is being made available to interested and concerned parties, including residents, property owners, community groups, the business community, elected officials, and public agencies.

A series of formal public hearings is also being held during this 45-day period, with one hearing in each county of the study corridor. The purpose of the hearings is to give interested parties an opportunity to meet with the study team as well as formally comment on the study and the Draft Tier 1 EIS analysis. Attendance at the hearings is not required to submit comments. Responses to comments received will be incorporated in the Final Tier 1 EIS.

Transportation Impacts

ADOT coordinated with local agencies to obtain readily available long-range transportation plans within the study corridor. Major existing and planned transportation facilities for each transportation mode were identified, including locations with substantial existing levels of congestion.

The concept for rail service within the Yellow and Orange corridor alternatives assumed higher speed train operation and a blend of intercity and commuter considerations. Service assumptions were developed to estimate ridership as well as the effect of resulting changes in vehicle miles traveled (VMT) on safety, energy use, and air quality. Ridership approximations were based on a passenger rail system built on hypothetical alignments used in the AA. A future alignment elsewhere within the corridor alternatives may have different impacts and would need to be reevaluated in Tier 2 studies.

FTA-developed modeling software was used to estimate ridership for each corridor alternative. Travel times and service frequencies were developed for each corridor alternative and included possible rail extensions to Tucson International Airport, Avondale, and Surprise. These extensions were not evaluated in the environmental analysis in this Draft Tier 1 EIS, however. Operating in an intercity pattern (i.e., stopping only at hub and regional stations), a passenger rail system in either corridor alternative was estimated to complete a Tucson-to-Phoenix trip in approximately 1 hour and 23 minutes. In a commuter pattern (stopping at every station), a passenger rail system within the corridor alternatives could complete the Tucson-to-Phoenix run in an estimated 2 hours and 10 minutes.

Projected automobile trip times between Tucson and Phoenix estimated for the No Build Alternative are compared to estimated passenger rail travel times for each corridor alternative in **Table ES-2** below.

Table ES-2. Estimated Rail and Auto Travel Times between Tucson and Phoenix

	Yellow Corridor Rail Alternative (Hrs:Min)	Orange Corridor Rail Alternative (Hrs:Min)	No Build Alternative (Auto Travel) (Hrs:Min)
2010			1:53
2035	1:23 (Intercity)	1:30 (Intercity)	2:22
2050	1:23 (Intercity)	1:30 (Intercity)	2:59

Ridership was estimated using a new FTA forecasting model called STOPS (Simplified Trips-on-Project Software). “Unlinked” trips are all the component segments of a transit trip identified separately (i.e., a transfer from one bus route to another represents two unlinked trips), while

"linked" trips count the entire trip from beginning to end as a single trip. This information is shown quantitatively in **Table ES-3**.

Table ES-3. Year 2035 Tucson-Phoenix Commuter and Intercity Trip Demand

	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative
Unlinked transit trips	476,000	475,000	451,000
Linked transit trips	343,000	343,000	324,000
Total Daily Rail Ridership	**20,060**	**18,080**	N/A
Intercity trips (>40 miles)	3,360	4,140	N/A
Commute trips (<40 miles)	16,700	13,940	N/A
Total by Service Type	20,060	18,080	
Daily VMT reduction	566,914	570,268	N/A
Daily VHT reduction	17,522	17,655	N/A

With a rail system in either corridor alternative, overall safety in the corridor could improve because passenger rail service would divert some automobile trips to an alternate mode of travel. The safety risk to travelers would decrease, as rail travel is statistically safer per passenger mile than auto travel, resulting in the improvements shown in **Table ES-4**.

Specific station locations have not yet been determined for this Tier 1 analysis. As ridership forecasts are refined, station area concept plans would be developed to allow the determination of required parking, transit amenities, and vehicular circulation.

Table ES-4. Safety Improvement (per 1,000,000 VMT in 2035)

	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative[a]
Annual fatality reduction	2.2	2.2	N/A
Annual injury reduction	33.2	33.4	N/A

Note: Assumes trains run 300 days a year.
[a] Potential increases in fatalities and injuries under the No Build Alternative were not estimated for this Tier 1 analysis.

Any impacts to adjacent properties as a result of station placement or configuration would be addressed during Tier 2 analysis if a corridor alternative is selected.

Summary of Potential Environmental Impacts

This section summarizes the potential impacts of implementing a passenger rail system in either the Yellow or Orange corridor alternatives, as well as the potential impacts of the No Build Alternative, based on the detailed analysis of the social, economic, and environmental

resources documented in **Chapter 5** of the Draft Tier 1 EIS. The potential impacts associated with each resource are listed in **Table ES-5**.

The potential impacts reported for many environmental resources are based on construction occurring within the entire 1-mile corridor alternative. For analysis in this Draft Tier 1 EIS, the entire width of the corridor alternatives is described with regard to existing conditions; however, for most environmental resources, constructing and operating a passenger rail system would not require the entire mile-wide study corridor. For these resources, potential impacts have been estimated based on the width of the affected area relative to the mile-wide corridor. Since specific alternative alignments have not been determined at this time, the environmental impacts reported are approximate. Specific resource impacts, such as the possibility of an adverse effect under Section 106 of the National Historic Preservation Act, a use of a Section 4(f) resource, or an adverse effect under Section 7 of the Endangered Species Act, would be determined during Tier 2 analyses once a specific alignment is under consideration.

Resources Eliminated from Analysis in the Tier 1 EIS

The following environmental resources are usually examined in an EIS but were not analyzed in this Draft Tier 1 EIS because they are not found within the study corridors.

- Wild and Scenic Rivers
- Navigable Rivers
- Outstanding Arizona Waters
- Landmarks

Environmental Impacts

Table ES-5 summarizes the potential for impacts of the No Build Alternative and the Yellow and Orange corridor alternatives based on existing conditions corridor-wide.

Table ES-5. Summary of Potential Impacts

Resource Topic	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative
Land Use	Impacts on land use, primarily on residential and agricultural	Impacts on land use, primarily on undeveloped and agricultural; longer corridor distance could increase impact by approximately 10 percent compared with the Yellow Corridor Alternative	Minor impacts, compared to corridor alternatives
Socioeconomics	Economic benefits provided through job creation, improved accessibility, and increased economic activity	Economic benefits similar to Yellow Corridor Alternative	Minor impacts to socioeconomic conditions
Title VI and Environmental Justice	Beneficial economic and mobility impacts; potential impacts on protected populations	Impacts similar to Yellow Corridor Alternative	No disproportionately high and adverse impacts
Public Health and Safety	Potential improvements to grade crossings and signals if aligned near UP; potential reduction in highway injuries	Impacts similar to Yellow Corridor Alternative	No improvements to public health and safety
Parklands	• 99 parks • 45 public recreation areas • 7 private parks and recreation areas	• 91 parks • 34 public recreation areas • 21 private parks and recreation areas	No impacts related to a passenger rail system
Section 4(f) and Section 6(f) Properties[a]	• 144 parks and recreation areas • 165 historic properties • 66 schools[b] • 11 refuges • 29 Section 6(f) Resources	• 125 parks and recreation areas • 127 historic properties • 61 schools[b] • 9 refuges • 31 Section 6(f) Resources	No impacts related to a passenger rail system

Table ES-5. Summary of Potential Impacts

Resource Topic	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative
Air Quality	Expected reduction in Vehicle Miles Traveled (VMT) and air pollutant emissions slightly less than Orange Corridor Alternative based on modeled ridership	Expected reduction in VMT and air pollutant emissions slightly greater than Yellow Corridor Alternative based on modeled ridership	Expected increase in VMT and air pollutant emissions compared to corridor alternatives because no passenger rail system would be built
Noise and Vibration	Compared to Orange Corridor Alternative: • Estimated 51,260 sensitive residential land uses • Lower potential for no noise impacts • Lower potential for moderate noise impacts • Similar potential for severe noise impacts • Higher potential for vibration impacts	Compared to Yellow Corridor Alternative: • Estimated 50,094 sensitive residential land uses • Higher potential for no noise impacts • Higher potential for moderate noise impacts • Similar potential for severe noise impacts • Lower potential for vibration impacts	No impacts related to a passenger rail system, but ongoing and increasing noise within I-10 corridor from volume of automobile traffic
Hazardous Materials	1,511 hazardous material facilities identified in corridor; lower potential for brownfield sites	1,142 hazardous material facilities identified in corridor; higher potential for brownfield sites	No impacts related to a passenger rail system; added highway congestion could increase traffic accidents and related fuel and other spills
Geology, Topography, Soils, and Prime and Unique Farmland	• 17,000 acres in subsidence areas • 235 fissures • 77,000 acres of prime and unique farmlands	• 20,300 acres in subsidence areas • 246 fissures • 83,000 acres of prime and unique farmlands	No impacts related to a passenger rail system

Table ES-5. Summary of Potential Impacts

Resource Topic	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative
Biological Resources	Less habitat acreage potentially lost to ROW compared to Orange Corridor Alternative. Protected species and suitable habitat within corridor alternative; medium impact to habitats and wildlife estimated by AGFD	More habitat acreage potentially lost to ROW compared to Yellow Corridor Alternative. Protected species and suitable habitat within corridor alternative; medium to high impact to habitats and wildlife estimated by AGFD	No impacts related to a passenger rail system
Waters of the United States	Impacts to four major Waters crossing the alternative likely to require Clean Water Act permitting	Impacts to three major Waters crossing the alternative likely to require Clean Water Act permitting	No impacts related to a passenger rail system
Wetlands	1,030 wetland acres, 550 likely jurisdictional	1,575 wetland acres, 850 likely jurisdictional	No impacts related to a passenger rail system
Water Quality	• Upper Santa Cruz & Avra Basin Sole Source Aquifer, 1 wastewater treatment plant, 24 named washes, 1,030 wetland acres, 1,791 well sites • AZPDES permit and SWPPP required	• Upper Santa Cruz & Avra Basin Sole Source Aquifer, 1 wastewater treatment plant, 26 named washes, 1,575 wetland acres, 1,647 well sites • AZPDES permit and SWPPP required	No impacts related to a passenger rail system; highway runoff pollutants could increase from increased traffic
Floodplains	9,330 acres within the 100-year floodplain	9,876 acres within the 100-year floodplain	No impacts related to a passenger rail system

Table ES-5. Summary of Potential Impacts

Resource Topic	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative
Energy Use and Climate Change	Annually: • 142 million fewer VMT • 66,710 fewer tons of carbon dioxide (CO_2) emissions • 3.04 million fewer gallons of fuel consumption	Annually: • 143 million fewer VMT • 67,104 fewer tons of carbon dioxide (CO_2) emissions • 3.06 million fewer gallons of fuel consumption	No impacts related to a passenger rail system; VMT in the three-county Study Area expected to increase substantially
Visual and Aesthetic Scenic Resources	Southern hub to Eloy: Minimal to moderate physical impacts Eloy to northern hub: Variable physical impacts, depending on location	Southern hub to Eloy: Minimal to moderate physical impacts Eloy to northern hub: Moderate to high physical impacts	No impacts related to a passenger rail system
Cultural Resources	• 372 known archaeological resources • 158 resources listed on the National Register of Historic Places • Corridor intersects Casa Grande National Monument	• 418 known archaeological resources • 126 resources listed on the National Register of Historic Places	No impacts related to a passenger rail system
Unavoidable Adverse Impacts / Irreversible and Irretrievable Commitment of Resources	• ROW may require conversion of substantial amounts of prime and unique farmland • Substantial commitments of construction materials, financial resources, and energy consumption	Impacts similar to Yellow Corridor Alternative; longer corridor distance could increase some impacts by approximately 10 percent	No impacts related to a passenger rail system; energy consumption could be higher as VMT continues to increase

Table ES-5. Summary of Potential Impacts

Resource Topic	Yellow Corridor Alternative	Orange Corridor Alternative	No Build Alternative
Short-Term Uses vs. Long-Term Productivity	Short-term construction impacts, including benefit of construction employment and economic activity; long-term benefits and productivity of passenger rail transportation and regional socioeconomic systems, and reduction in air pollutant emissions	Impacts and benefits similar to Yellow Corridor Alternative; longer corridor distance could increase some impacts by approximately 10 percent	No impacts related to a passenger rail system; minimal improvement in transportation network
Indirect and Cumulative Impacts	Reduced traffic congestion and pollutant emissions; reduced ridership of existing transportation modes; increased chance of hazardous material incidents and water pollution; transit-oriented development near stations	Impacts and benefits essentially the same as with the Yellow Corridor Alternative	Expected increase in vehicular traffic congestion and energy consumption, and decrease in air quality

Notes:

[a] Resources include those within a 0.25-mile buffer around each corridor alternative to account for Section 4(f) resources that could be subject to potential constructive use impacts (e.g., noise and visual impacts) that may extend beyond the corridor boundaries.

[b] Athletic fields or other recreational facilities at schools must be publicly available to qualify for Section 4(f) protection. Availability of school recreational facilities would be determined during Tier 2.

All potential impacts shown are preliminary and have been evaluated at a Tier 1 level of analysis. Impacts would be reviewed and revised as necessary in future Tier 2 NEPA documents if a corridor alternative is selected.

Potential Mitigation

Table ES-6 introduces types of mitigation for impacts to resources that would potentially result from implementation of a passenger rail system within either the Yellow or Orange corridor alternative, as identified through the Tier 1 NEPA process. Specific mitigation measures would be identified and discussed, should a corridor alternative become the selected alternative, during Tier 2 analysis after design details are known, recorded in NEPA documents as specific impacts are identified, and implemented prior to construction. The resource categories below are presented in the same order as discussed in the table above.

Table ES-6. Potential Mitigation

Affected Resource	Potential Mitigation
Land Use	The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, and the Civil Rights Act of 1964 govern displacements and relocations. During Tier 2, local government entities and the public would be engaged in the process of selecting specific locations for rail facilities such as rail stations to minimize the potential for land use conflicts.
Socioeconomics	Strategies to avoid, minimize, or mitigate potential impacts on socioeconomic conditions (neighborhoods, community facilities, businesses, employment) would be considered in the design process. Coordination with local job placement agencies would help mitigate the impacts of potential job loss associated with displacement. Public involvement and agency coordination activities may help identify potential mitigation needs. Adverse impacts on the elderly and people with disabilities would be mitigated by compliance with the Americans with Disabilities Act.
Title VI and Environmental Justice	Actively involving Environmental Justice (EJ) populations in the decision-making process during Tier 2 could help avoid, minimize, or mitigate disproportionately high and adverse health or environmental effects of the rail system on protected populations. Public engagement would aid planners in preventing the denial of, reduction in, or significant delay in the receipt of benefits by EJ populations in accordance with Title VI of the Civil Rights Act of 1964 and Executive Order 12898.
Public Health and Safety	FRA's *High Speed Passenger Rail Safety Strategy* (FRA 2009) offers guidance in the design and construction of a passenger rail system. Tier 2 NEPA studies would address safety measures and strategies to protect the health and safety of passengers, motorists, and pedestrians at grade crossings.
Parklands	Tier 2 NEPA documents would identify specific impacts. Potential mitigation measures to avoid or minimize impacts could include moving equipment and facilities to another location within existing parkland, purchase of similar properties, and planting vegetation to offset removed vegetation and/or establish visual and auditory screening.

Table ES-6. Potential Mitigation

Affected Resource	Potential Mitigation
Section 4(f) and 6(f) Resources	Mitigation measures for direct or constructed use of Section 4(f) resources would be determined, to the extent required, in consultation with the agency owning or administering the resource. Minimization of harm could include alternative designs and/or mitigation measures that compensate for residual impacts. Impacts on Section 6(f) Land and Water Conservation Fund lands could include replacement property of equal fair market value and of reasonably equivalent usefulness for recreation purposes
Air Quality	In Tier 2, mitigation to reduce emissions of nitrogen oxides (NO_x) to be investigated include using cleaner alternative fuels and implementing idling restrictions for construction equipment and locomotives. General air quality and/or transportation conformity analysis modeling may be required to verify these findings.
Noise and Vibration	During Tier 2, measures to mitigate noise and ground-borne vibration would be evaluated. Noise mitigation measures may include sound-damping devices on vehicles and equipment, regular maintenance such as wheel truing and rail grinding, minimum turning radii, lubrication, barriers, quiet zones, buffer zones, ballast, acquisition of affected properties, and insulation, among others. Other options include location and design of track turnouts and crossovers, modifications to track support systems and affected buildings, adjustments to vibration transmission paths such as barrier trenches, reduced train speeds, and minimizing train operations at night.
Hazardous Materials	Potential impacts on or from National Priority List (NPL) Superfund and other sites would be further evaluated in Tier 2 to determine level of risk and potential mitigation procedures. These include safety procedures and protection of human health and the environment to help ensure no further contamination of adjacent sites and to provide a safe working environment during construction. Solid waste materials generated during construction could be recycled or disposed of properly.
Geology, Topography, Soils, and Prime and Unique Farmland	During Tier 2, coordination would take place with the Natural Resources Conservation Service. Form NRCS-CPA-106, Farmland Conversion Impact Rating for Corridor Type Projects, would be required to determine if farmland impacts warrant consideration of farmland protection measures.
Biological Resources	During Tier 2, impacts to biological resources would be coordinated with US Fish and Wildlife Service (USFWS) and Arizona Game and Fish Department (AGFD). Mitigation measures could include restrictions on construction activities during the breeding/nesting seasons. Section 7 consultation with USFWS would take place to determine a project's potential to affect a federally listed species and, if so, to what extent. Mitigation measures would also be determined as part of the consultation. Impacts on state-listed species would also be assessed during Tier 2. If these should occur, AGFD would coordinate in determining potential mitigation measures. Standard ADOT mitigation measures would be implemented to control the

Table ES-6. Potential Mitigation

Affected Resource	Potential Mitigation
	spread of nonnative and invasive species.
Waters of the United States	Impacts on waterways and waterbodies would be discussed in more detail during Tier 2. Mitigation could include in-lieu fees, and vegetation or habitat restoration. During design, coordination would take place with the US Army Corps of Engineers (Corps) and appropriate state agencies to develop mitigation strategies.
Wetlands	During Tier 2, wetlands would be reviewed to determine where it is possible and practical to avoid or minimize impacts, using pilings or bridges or through other measures. Mitigation options for unavoidable impacts would be discussed in more detail and could include in-lieu fees and onsite or offsite permittee-responsible mitigation. During design, the Corps and appropriate state resource agencies would coordinate with ADOT to develop mitigation strategies.
Water Quality	Construction General Permits would need to be obtained as part of Tier 2 to authorize any stormwater discharges associated with construction of a future passenger rail system. Best Management Practices (BMPs) for the Storm Water Pollution Prevention Plan (SWPPPs) would be confirmed in Tier 2. The required Water Quality Certifications would be addressed prior to any work in jurisdictional waters. Mitigation for impacts on mapped or unmapped wells, including proper abandonment (such as plugging and sealing) to prevent groundwater pollution would also be addressed.
Floodplains	Flood control districts with jurisdiction would be provided the opportunity to review and comment on the design plans. After construction, all work sites and fills would be removed and the affected areas returned to former elevations. Floodplain modifications may require a Letter of Map Revision (LOMR) to account for changes to areas that may be subject to floods. Other mitigation measures could include restoring natural floodplain values by seeding with native vegetation and proper design of bridges and culverts to prevent flood flow restriction. Specific mitigation measures would be identified during Tier 2 and implemented prior to construction.
Energy Use and Climate Change	Mitigation may not be required for energy and climate change because diverting trips from other modes of transportation would be beneficial, lowering the overall generation of CO_2 emissions. This would be verified during Tier 2 NEPA studies.
Visual and Aesthetic Scenic Resources	Through continued public involvement during Tier 2, residents' concerns about potential views would be identified. Mitigation could include revegetation of disturbed areas, visual screening of railroad facilities from adjacent sensitive areas, context-sensitive design of aesthetic features, and landscaping that would complement and blend with the context of the surrounding visual environment.

Table ES-6. Potential Mitigation

Affected Resource	Potential Mitigation
Cultural Resources	Consultation with all consulting parties over potentially affected properties would be key to further project development. Casa Grande Ruins National Monument should be avoided, and close coordination with tribal communities and the National Park Service should occur with regard to proximity of the passenger rail system and monument boundaries. Adverse effects to historic properties could be mitigated by additional research to recover data or exhaust the information potential of a site, changes in project design, development of a Memorandum of Agreement (MOA), and other options resulting from Section 106 consultation. Specific mitigation could include a programmatic agreement (PA), a MOA with a public involvement component, data recovery, archaeological treatment plans, historic buildings surveys, and historic engineering record documentation. Avoidance of these properties and mitigation of potential visual and audible impacts would be considered in Tier 2.
Indirect and Cumulative Impacts	Specific mitigation measures, to the extent required, would be discussed in Tier 2 NEPA documents as specific indirect and cumulative impacts are identified.

Cost Analysis

Cost estimates were developed based upon general alignments assumed for a passenger rail system within the Yellow and the Orange corridor alternatives. Though no specific passenger rail technology has been selected, estimates were based on a Diesel Multiple Unit (DMU) capable of higher-speed rail (up to 125 miles per hour).

Capital cost calculations took into consideration infrastructure improvements and annual operating and maintenance costs based upon an assumed intercity and commuter rail operating plan. Capital cost estimates were developed for opening year, horizon year (2035), and long-range future, based on current railroad industry unit prices. The annual intercity and commuter rail operating and maintenance cost estimates were based upon current, similar rail operations located in the western US.

A capital plan was not fully developed for the Tier 1 EIS. More detail would be provided in the project-level Tier 2 NEPA document when funding sources are known. New assumptions about annual and total receipt of federal revenues would be identified based on feedback from FRA and FTA.

Capital Cost Estimates

The capital cost estimates in 2013 dollars, excluding any finance charges, are $4.5 billion for a passenger rail system within the Yellow Corridor Alternative and $7.6 billion for a passenger rail system within the Orange Corridor Alternative. Using the No Build Alternative as a baseline, these figures represent the additional cost to build a passenger rail system in either of the corridor alternatives. A breakdown of these figures is provided in **Table ES-7** and **Table ES-8** below.

Table ES-7. Estimated Capital Costs for a Rail System within the Yellow Corridor Alternative

ADOT Intercity Corridor Alternative: YELLOW				119.8 Route Miles	
FTA Major Standard Cost Categories	**Base Year Cost w/o Contingency (x000)**	**Base Year Allocated Contingency (x000)**	**Base Year Dollars Total (x000)**	**Base Year $ Percentage of Construction Cost**	**Base Year $ Percentage of Total Cost**
10 Guideway & Track Elements	$1,466,063	$111,935	$1,577,997	55%	35%
20 Stations, Stops, Terminals, Intermodal	$38,333	$63,963	$102,296	4%	2%
30 Support Facilities: Yards, Shops, Admin. Buildings	$148,000	$63,963	$211,963	7%	5%
40 Sitework & Special Conditions	$449,471	$95,944	$545,415	19%	12%
50 Systems	$356,060	$79,953	$436,013	15%	10%
Construction Subtotal (10 - 50)	**$2,457,927**	**$415,758**	**$2,873,685**	**100%**	
60 ROW, Land, Existing Improvements	$120,760	$127,926	$248,686		6%
70 Vehicles	$368,000	$95,944	$463,944		10%
80 Professional Services	$251,450		$251,450		6%
Subtotal (10 - 80)	**$3,198,138**	**$639,628**	**$3,837,765**		
90 Unallocated Contingency			$639,628		14%
Total (10 - 90)			**$4,477,393**		**100%**

Table ES-8. Estimated Capital Costs for a Rail System within the Orange Corridor Alternative

ADOT Intercity Corridor Alternative: ORANGE				128.5 Route Miles	
FTA Major Standard Cost Categories	**Base Year Cost w/o Contingency (x000)**	**Base Year Allocated Contingency (x000)**	**Base Year Dollars Total (x000)**	**Base Year $ Percentage of Construction Cost**	**Base Year $ Percentage of Total Cost**
10 Guideway & Track Elements	$3,291,156	$297,301	$3,588,456	67%	47%
20 Stations, Stops, Terminals, Intermodal	$70,833	$135,137	$205,970	4%	3%
30 Support Facilities: Yards, Shops, Admin. Buildings	$106,000	$108,109	$268,109	5%	4%
40 Sitework & Special Conditions	$614,884	$162,164	$777,048	15%	10%
50 Systems	$362,710	$135,137	$497,847	9%	7%
Construction Subtotal (10 - 50)	**$4,445,583**	**$837,847**	**$5,337,430**	**100%**	
60 ROW, Land, Existing Improvements	$51,620	$108,109	$159,729		2%
70 Vehicles	$400,000	$135,137	$535,137		7%
80 Professional Services	$454,262		$454,262		6%
Subtotal (10 - 80)	**$5,405,466**	**$1,081,093**	**$6,486,559**		
90 Unallocated Contingency			$1,081,093		14%
Total (10 - 90)			**$7,567,652**		**100%**

Currently no funding sources are identified for the construction and operation of a passenger rail system. A detailed financial plan would be developed if a corridor alternative is selected and a Tier 2 NEPA document is prepared.

Operating and Maintenance Plan

Operating and maintenance cost calculations were based on the actual costs of existing rail operations throughout the country with similar characteristics to those planned within each corridor for this passenger rail system within each corridor.

The estimated operating and maintenance costs are based on trip length, travel times, route miles, and fleet size for intercity and commuter service for each corridor alternative. The total estimated annual operating and maintenance cost estimates (based on 2013 US dollars) are approximately $66.8 million for a passenger rail system within the Yellow Corridor Alternative, and $86 million for a passenger rail system within the Orange Corridor Alternative, as shown in **Table ES-9** below.

Table ES-9. Comparative Estimated Annual Operating and Maintenance Costs by Corridor Alternative and Service Type

	Yellow Corridor Alternative		Orange Corridor Alternative	
Service Type	**Intercity**	**Commuter**	**Intercity**	**Commuter**
Trip Length (miles)	119.8	119.8	128.5	128.5
One Way Trip Time, NB/SB[a] (minutes)	83/82	95/96	83/85	98/99
Number of Cars[b]	8	4	8	5
Fleet Size[c]	5	13	4	15
	Yellow Corridor Alternative		**Orange Corridor Alternative**	
Service Type	**Intercity**	**Commuter**	**Intercity**	**Commuter**
One-Way Trips per Weekday	16	56	16	56
Weekday Miles	1,916.8	6,708.8	2,056	7,196
Annual Revenue Miles[d]	498,368	1,744,288	534,560	1,870,960
Unit Cost [e-g] (Operating Expense per Vehicle Mile)	$29.79	$29.79	$35.75[h]	$35.75[h]
Estimated O&M[i] Cost	$14,846,383	$51,962,340	$19,110,520	$66,886,820
Total Estimated Annual O&M Cost	**$66,808,722**		**$85,997,340**	
Average Operating Cost/ Route Mile	$557,668		$669,240	

Notes:
[a] Northbound Trip / Southbound Trip
Cost Assumptions:
[b] Based on diesel multiple unit (DMU) train
[c] Includes 1 spare train for each rail service
[d] Weekdays only service assumes 260 operating days per year
[e] Operating Expenses per Vehicle Revenue Mile are in 2013 US Dollars
[f] Operating Expense per Vehicle Revenue Mile from 2012 National Transit Database plus 3% inflation per year to 2013
[g] Operating Expenses per Vehicle Revenue Mile is based on the average value of 14 existing transit systems across the US that have similar operations
[h] Operating Expenses per Vehicle Mile average cost inflated by 50% to take into account higher operating speed and structures estimated for this rail system
[I] O&M=Operating and Maintenance

Cash Flow Plan

A cash flow analysis would be developed if a corridor alternative is selected and when funding mechanisms with annual sources and uses of funds are defined. The cash flow plans would depend on the type of funding used to pay for construction and operations. Options include a pay-as-you-go approach or debt financing construction, or a combination of the two approaches. The selected approach could have differing effects on the timing of impacts (e.g.,

acquisition of adjacent properties or construction) and on the financial management of the program. These concepts would be further developed during Tier 2 studies if a corridor alternative is selected.

Financial Risks and Uncertainties

The greatest financial risk to developing a passenger rail system within either corridor alternative is the potential inability to secure funding for construction, operation, and maintenance. Other financial risks could include issues affecting or delaying property acquisition and the cost of property acquisition, the volatility of material costs, and their effect on the overall cost estimate. Another factor affecting the total cost estimate is the cost share among competing projects and how costs would be shared between modes.

Comparison of Alternatives

In order to accomplish a multidisciplinary evaluation of alternatives, an Alternatives Analysis (AA) was undertaken as part of the APRCS that involved conceptual engineering of possible alternative alignments at a level appropriate for cost estimating, scheduling, operational analyses, and community involvement. The findings of that analysis are combined with corridor-level analysis of potential environmental impacts to compare the potential performance and impacts of a passenger rail system within each corridor alternative with the No Build Alternative.

A passenger rail system within the Yellow Corridor Alternative would be more compatible with existing local plans and property ownership; serve a larger population; and potentially affect slightly fewer natural resources, sensitive noise receptors, viewers, and known archaeological resources than a passenger rail system within the Orange Corridor Alternative. The potential to affect historic resources, hazardous materials, and parks would be slightly greater within the Yellow Corridor Alternative compared to a passenger rail system within the Orange Corridor Alternative. Although serving a smaller population, a passenger rail system within the Orange Corridor Alternative has a greater potential to reduce gasoline consumption and criteria pollutant emissions than a passenger rail system within the Yellow Corridor Alternative. The potential to affect water resources, wildlife corridors, and potential species habitat would be greater within the Orange Corridor Alternative. Compared to the No Build Alternative, a passenger rail system within either corridor alternative offers increased access to transit for protected populations and economic generators as well as improved air quality and energy consumption.

A passenger rail system within the Orange Corridor Alternative would require nearly double the capital cost as one within the Yellow Corridor Alternative and would be more difficult to implement. The operating and maintenance costs would be higher as well. While the ROW cost for a passenger rail system within the Yellow Corridor Alternative is potentially higher than one

within the Orange Corridor Alternative, the lower estimated annual operating cost would recover the difference in estimated ROW cost within the first six years of operation. The No Build Alternative would not incur any of these costs, but it would not meet the identified purpose and need for an alternate transportation mode between Tucson and Phoenix.

A passenger rail system within the Yellow Corridor Alternative would provide shorter trip times to a larger total number of riders, with reductions in injuries and fatalities over the No Build Alternative similar to those for a passenger rail system within the Orange Corridor Alternative.

Potential impacts to the community and other environmental resources; financial feasibility, ease of implementation, and operating characteristics; and mobility and safety are compared in **Table ES-10**. Quantities of potentially affected parks and potential noise receptors were estimated for narrower corridors, in addition to the mile-wide corridor numbers; the estimated number of resources potentially affected appears in parentheses directly beneath the quantity for the mile-wide corridors.

Comparison Summary and Recommended Preferred Alternative

Considering the overall estimated costs, projected ridership, and potential environmental impacts associated with implementing passenger rail within one of the corridor alternatives, a passenger rail system within the Yellow Corridor Alternative is considered to be more cost efficient and better performing than a passenger rail system within the Orange Corridor Alternative, with similar potential impacts to the environment. Therefore, ADOT recommends the Yellow Corridor Alternative as the preferred alternative in the Draft EIS; however, concerns voiced during continued public and agency outreach have prompted the development of options for the Yellow Corridor Alternative to identify alignments to be investigated in future Tier 2 NEPA analyses. While the corridor alternatives are centered on transportation system alignments (such as the UP or the proposed alignment of the North-South Corridor), difficulties in following these alignments could arise upon further analysis in the Final Tier 1 EIS or if Tier 2 studies are initiated. Based on that recommendation and the analysis in this EIS, ADOT has recommended the Yellow Corridor Alternative as the preferred alternative for purposes of NEPA.

With the corridor alternatives, the Yellow Corridor Alternative could be used through Tempe in an otherwise Orange Corridor Alternative; or the Orange Corridor Alternative could be used in an otherwise Yellow Corridor Alternative. These routing options through Tempe could be used to avoid or minimize potential Section 4(f) uses and/or potential adverse effects to historic properties.

Should an alignment in Pinal County along UP ROW or elsewhere within the 1-mile-wide corridor not be feasible, a portion of the Orange Corridor Alternative that generally extends

along the planned North-South Corridor from I-10 to the Copper Basin Railroad could be utilized. This segment was part of the Teal Alternative eliminated in the Level Three Screening.

Table ES-10. Comparison of Community and Environmental Criteria

Criterion	Yellow Corridor	Orange Corridor	No Build
Potential need for conversion of non-transportation land uses	Moderate	Moderate to High	N/A
Compatibility with local plans	Compatible	Moderately Incompatible	Compatible
Compatibility with underlying property ownership	Moderately Incompatible	Compatible	Compatible
Compatibility of station areas[a]	Compatible	Moderately Incompatible	N/A
Existing population within station area district[b]	851,713	717,329	N/A
Existing employment within station area district[b]	796,426	726,212	N/A
Future population within station area district[b]	1,188,103	1,027,518	N/A
Future employment within station area district[b]	1,036,490	939,520	N/A
Existing minority population within station area district[b]	481,916	404,114	N/A
Existing low-income population within station area district[b]	296,018	265,145	N/A
Parks (200-foot ROW corridor)	151 (21)	146 (20)	N/A
Daily reduction in NO_x emissions (STOPS)[c] (kg.)	516	519	[d]
Daily reduction in CO emissions (STOPS) (kg.)	9,507	9,563	[d]
Daily reduction in VOC emissions (STOPS) (kg.)	340	342	[d]
Daily reduction in PM_{10} emissions (STOPS) (kg.)	6	6	[d]
Daily reduction in CO_2 emissions (STOPS) (kg.)	242,072	243,504	
Daily reduction in SO_2 emissions (STOPS) (kg.)	2.39	2.40	
Potential noise receptors (within 1,800-foot sensitivity distance)	51,260 (39,450)	50,094 (34,155)	N/A
Potential vibration impact receptors	4,925	2,325	N/A
Hazardous materials sites	1,511	1,142	[e]
Rivers, washes, or arroyos (linear feet)	1,480,187	1,910,872	[e]
Potential wetlands (acres)	1,032	1,476	[e]
100-year Floodplain (acres)	9,330	9,876	[e]
Wildlife corridors	20	26	[e]
Wildlife linkage zones crossed (miles)	20.3	32.93	[e]
Annual reduction in gasoline usage (gallons)	3,037,000	3,058,000	[d]
Visual, aesthetic, and scenic resource impacts	Minimal to Moderate	Moderate to High	Minimal
Known archaeological resources	372	418	[e]
Historic resources listed on the National Register of Historic Places	158	126	[e]

Table ES-10. Comparison of Community and Environmental Criteria

Criterion	Yellow Corridor	Orange Corridor	No Build
Annual operating cost for commuter rail portion of service (2013 dollars)	$67.0 Million	$86.0 Million	$0
Capital cost (2013 dollars)	$4.5 Billion	$7.6 Billion	$0
Annual operating cost per commuter rail passenger (2013 dollars)	$10.37	$15.99	$0
Annual operating cost per intercity rail passenger (2013 dollars)	$14.73	$15.38	$0
Right-of-Way cost (2013 dollars)	$144.9 Million	$62.1 Million	$0
Ease of Implementation	Moderate	Low	N/A
Predictability and Dependability	Moderate	High	Low
Urban stations (conceptual)	14	12	0
Rural stations (conceptual)	1	3	0
Daily commuter ridership	16,700	13,940	0
Daily intercity ridership	3,360	4,140	0
Reduction in automobile VMT (STOPS)	566,914	570,268	0
Transit and pedestrian connectivity[f]	D	C	F
Tucson to Phoenix commuter rail travel time (hours:minutes)	1:35	1:45	N/A
Tucson to Phoenix intercity rail travel time (hours:minutes)	1:23	1:30	2:22[g]
Estimated at-grade crossings[h]	112	55	0[i]
2035 reduction in fatalities per million VMT (STOPS)	2.2	2.2	0[j]
2035 reduction in injuries per million VMT (STOPS)	33.2	33.4	0[j]

[a] Conceptual station areas at major intersections or activity centers; not specific sites
[b] A 3-mile radius surrounding each conceptual station area
[c] Simplified Trips-on-Project Software (STOPS) is a ridership modeling program utilized by FTA
[d] Likely increases in pollutant emissions and gasoline usage from increased vehicular congestion not calculated for this Tier 1 analysis
[e] Potential impacts from other reasonably foreseeable projects are not calculated for this Tier 1 analysis
[f] Graded on an A-F scale with "A" offering the greatest number of transit and pedestrian connections, and "F" the lowest number of connections
[g] Year 2035 Baseline. Travel time by automobile using I-10
[h] At-grade crossings inferred based on ADOT rail crossing database and aerial photography review
[i] Via I-10
[j] Zero reduction in fatalities and injuries; potential increases from traffic congestion not calculated for this Tier 1 analysis

Next Steps

Input from the public, resource agencies, and tribes will be considered to complete the Tier 1 process. If the federal lead agencies select a corridor alternative, Tier 2 studies and NEPA documentation would need to occur before design and construction of any passenger rail

facility could be completed. The additional analysis required for Tier 2 studies, NEPA documentation, and design needed to advance to the project level are described in this section.

Tier 1 Completion

Comments received on this Draft Tier 1 EIS during the comment period will be used to prepare and issue a Final Tier 1 EIS that addresses these comments. Following the distribution of the Final Tier 1 EIS, a Record of Decision will be developed, documenting the federal decision of the selected alternative and the process for accommodating mitigation measures that would need to be implemented if a corridor alternative is selected. Because this is a Tier 1 NEPA document, most mitigation measures represent commitments to further coordination with the public, resource and regulatory agencies, and tribes during Tier 2 studies as a project-level design is developed.

Tier 2 Operable Sections

If federal funding becomes available, Tier 2 studies and NEPA documentation would be advanced for logical operable sections of a passenger rail system. One or more operable sections of a future passenger rail system between Tucson and Phoenix could be developed as individual projects. A separate Tier 2 NEPA document would be prepared for each project identified; depending on the potential for impacts, this could be an EIS, an Environmental Assessment (EA), or a Categorical Exclusion (CE). Any such segment would be required to have independent utility, with or without construction of other segments. Preliminary design would be conducted in support of those Tier 2 studies to supply more detailed information needed to identify specific resources affected by construction, and to what extent.

During Tier 2, a series of environmental analyses are anticipated to comply with NEPA due to the likelihood of environmental impacts identified in the Tier 1 analysis. Coordination and outreach would occur during Tier 2 studies to engage the public more fully regarding the effects on property and issues such as station design and other railroad facilities. Input from the outreach effort would be incorporated into the NEPA analysis and project design.

In addition to NEPA documentation, numerous technical studies would be completed as part of the Tier 2 NEPA process to acquire a more detailed understanding of the nature and magnitude of impacts. The analyses would consider avoidance and minimization of impacts on sensitive environmental resources. For each Tier 2 section, the following studies and technical reports may be required:

- Detailed site-specific alternatives analysis
- Wetland delineations and identification of Clean Water Act Section 404 permitting requirements

- Cultural resource surveys and National Historic Preservation Act Section 106 consultation
- Threatened and endangered species surveys
- Noise and vibration analysis
- Section 4(f) evaluation
- Section 6(f)
- Phase I Environmental Site Assessments
- Air emissions analysis in nonattainment areas
- Station-area traffic studies
- Engineering surveys

Coordination with Other Studies

To ensure consistency in planning and provide alternative mode opportunities in future or expanding corridors being studied, the APRCS will coordinate with transportation planning studies whenever possible and appropriate.

Mitigation Planning

Specific impact mitigation would be developed during Tier 2 including wetland mitigation, construction timing restrictions, stormwater pollution and prevention plans, BMP, and documentation of historic structures and other properties. Specific mitigation would be determined in consultation with federal or state regulatory agencies responsible for assessing impacts on a given resource. As needed, formal consultation would occur with resource agencies to address obligations to minimize and mitigate impacts. The Tier 2 effort would also require analysis under both Section 4(f) of the Department of Transportation Act and Section 6(f) of the Land and Water Conservation Act and appropriate mitigation, if needed.

Project Commitments

This Draft Tier 1 EIS identifies potential mitigation commitments that could be used in subsequent phases for each relevant environmental resource. During Tier 1, the primary commitments have been to work with the public, public jurisdictions, regulatory agencies, and tribes to identify the need for specific mitigation measures to be developed during Tier 2 for implementation during construction and operation of a passenger rail system.

Phased Implementation

ADOT anticipates that a passenger rail system would be incrementally funded and that construction and operation would be implemented in phases. Within the approximately

20-year planning horizon, initial and successive phases would be considered through the interim implementation phase, which is the last phase that would be implemented using information from the existing Service Development Plan.

Funding could be initially allocated for improvement of facilities to support higher speeds or improve/construct particular stations and maintenance and layover facilities on existing freight railroads. Service could initially start with fewer stations and with fewer round trips. As more funding becomes available, further construction could take place to expand service. The specific phasing of a future passenger rail system is not known at this time but would be determined as funding is allocated.

Station Locations

This Draft Tier 1 EIS does not identify specific station locations. Conceptual locations were included in the AA to provide a basis for corridor definition and ridership forecasting. Various station typologies were developed to provide context for station decision-making and local commitments; however, exact station locations would require more analysis and further agency and community input. Independent localized studies and Tier 2 NEPA documentation would include rail passenger stations if a corridor alternative is selected.

Airport Connections

During the AA and the Draft Tier 1 EIS, airport access was identified by the public as an important feature of future passenger rail service. Tucson International Airport, Phoenix-Mesa Gateway Airport, and Sky Harbor International Airport each have the potential to be connected to a future passenger rail system; but no detailed evaluation of alignments, impacts, or other implications of the connections has taken place. These analyses would be undertaken as part of future studies if a corridor alternative is selected.

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Abbreviations, Acronyms, and Short Forms

AA	Alternatives Analysis
ACS	American Community Survey
ADA	Americans with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ALRIS	Arizona Land Resource Information System
AMA	Active Management Area
amsl	above mean sea level
APRCS	Arizona Passenger Rail Corridor Study
APTA	American Public Transportation Association
A.R.S.	Arizona Revised Statutes
ASLD	Arizona State Land Department
ASTM	American Society for Testing and Materials
AWLW	Arizona Wildlife Linkages Workgroup
AZGS	Arizona Geological Survey
AZPDES	Arizona Pollutant Discharge Elimination System
AZTDM2	Arizona Statewide Travel Demand Model version 2
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMP	best management practice
BRT	bus rapid transit
BTU	British thermal unit
C	candidate (ESA)
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CAG	Central Arizona Governments
CAP	Central Arizona Project
CART	Central Arizona Regional Transit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CH_4	methane
CLS	Conservation Lands System

CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
Corps	United States Army Corps of Engineers
Council	Advisory Council on Historic Preservation
CST	Corridor Support Team
CTPP	Census Transportation Planning Package
CWA	Clean Water Act
D	delisted (ESA)
dB	decibel(s)
dBA	A-weighted noise level in decibels
DHHS	Department of Health and Human Services
DMU	diesel multiple unit
DVD	digital video disc
E	endangered (ESA)
EIS	Environmental Impact Statement
EJ	Environmental Justice
EMU	electric multiple unit
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESRI	Environmental Systems Research Institute
et seq.	and the following (Latin *et sequentes or et sequentia*)
^{o}F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection and Policy Act
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	fiscal year
GBN	ground borne nose
GBV	ground borne vibration
GHG	greenhouse gas
GIS	geographic information system
GRIC	Gila River Indian Community
HS	harvest restricted (native plants)

HOV	high occupancy vehicle
I-10	Interstate 10
L1UB	Lacustrine Limnetic Unconsolidated Bottom (wetland)
L2UB	Palustrine Littoral Unconsolidated Bottom (wetland)
L_{dn}	day night noise level
LEP	limited English proficiency
L_{eq}	equivalent noise level
L_{max}	maximum pass by sound level
LQG	large quantity generator
LUST	leaking underground storage tank
LWCF	Land and Water Conservation Fund
MAG	Maricopa Association of Governments
MBTA	Migratory Bird Treaty Act
MF	multi family
MJ	Megajoule
MOA	memorandum of agreement
mpg	miles per gallon
mph	miles per hour
MPO	metropolitan planning organization
MSATs	mobile source air toxics
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRPR	Natural Resources, Parks and Recreation (Pima County)
NWI	National Wetland Inventory
NWP	Nationwide Permit
O_3	ozone
OHWM	ordinary high water mark
OU	operating unit
P&R	Parks and Recreation Department

PA	programmatic agreement
PAG	Pima Association of Governments
Pb	lead (chemical element)
PCAQCD	Pinal County Air Quality Control District
PE	proposed for listing as endangered (ESA)
PEL	Planning and Environmental Linkages
PEM	Palustrine Emergent (wetland)
PFO	Palustrine Forested (wetland)
PHX	Phoenix Sky Harbor International Airport
PKT	passenger kilometer traveled
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns
PM_{10}	particulate matter less than or equal to 10 microns
ppb	parts per billion
ppm	parts per million
PSS	Palustrine Scrub Shrub (wetland)
PUB	Palustrine Unconsolidated Bottom (wetland)
R2UB	Riverine Lower Perennial Unconsolidated Bottom (wetland)
R2US	Riverine Lower Perennial Unconsolidated Shore (wetland)
R4SB	Riverine Intermittent Streambed (wetland)
R4SBAx	Riverine Intermittent Streambed Temporarily Flooded Excavated (wetland)
R4SBJ	Riverine Intermittent Streambed Intermittently Flooded (wetland)
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
ROW	right-of-way
RS	Recreation Services (City of Tempe)
S	sensitive (species)
SAFETEA LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (2005)
SCMPO	Sun Corridor Metropolitan Planning Organization
SDCP	Sonoran Desert Conservation Plan
SO_2	sulfur dioxide
SF	single family
SHPO	State Historic Preservation Office
SR	salvage restricted (native plants)
SR	State Route
SRP-MIC	Salt River Pima-Maricopa Indian Community
spp.	species (plural)

ssp.	Subspecies
STOPS	Simplified Trips-on-Project Software
SWPPP	Stormwater Pollution Prevention Plan
T	threatened (ESA)
TCP	traditional cultural property
THPO	Tribal Historic Preservation Office
TIA	Tucson International Airport
TIP	Transportation Improvement Program
Title VI	Title VI of the Civil Rights Act of 1964
TMDL	Total Maximum Daily Load
TNW	traditional navigable water(s)
TRI	toxic release inventory
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
U.S.C.	United States Code
UP	Union Pacific Railroad
US	United States
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	underground storage tank
USDOT	United States Department of Transportation
var.	variety
VASR	Visual and Aesthetic Scenic Resources
VdB	vibration decibel(s)
VHT	vehicle hours travelled
VMT	vehicle miles travelled
VOC	volatile organic compounds
Waters	Waters of the United States
WSC	Wildlife of Special Concern (in Arizona)